BFP-22

MINERAL NUTRIENT IMBALANCE, TOTAL ANTIOXIDANT LEVEL AND DNA DAMAGE INVOLVED IN TOXICITY IN *PHASEOLUS VULGARIS L.* SEEDLINGS EXPOSED TO METAL IONES

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The present study aimed to analyze the biological effects induced by bioaccumulation of metals, Cu, Cd, Pb, Zn, Ni and Mn in model plant (*Phaseolus vulgaris L., Fabaceae*). Effects of mineral nutrient imbalance, total antioxidant level and DNA damage induced by heavy metals were investigated in bean seedlings treated with two concentrations of 150 and 350 mg L^{-1} of selected metals for seven days. The results demonstrated that the increasing metal concentration changed synchronously metal content in samples, decreased total antioxidant activity (assessed by Ferric-Reducing Antioxidant Power – FRAP assay) in all samples with exception for samples treated with Ni and Cd. DNA damages were investigated by Random Amplified Polymorphic DNA (RAPD) method. The results demonstrated that the increasing metal concentrations induced changes in RAPD profiles (disappearance and/or appearance of bands in comparison with untreated control samples). The highest number of missing bands was observed in samples treated with zinc (total 4 bands) and nickel (total 4 bands) at both concentrations. These results suggested that mineral nutrient imbalance is involved in changes of antioxidant levels and DNA damages of the seedlings, which may help to understand the mechanism of metal toxicity in plants.

Key words: toxicity, heavy metals, antioxidants, *Phaseolus vulgaris*, RAPD, FRAP